Return to Flight

Space Shuttle *Discovery* launched from NASA's Kennedy Space Center July 26, ending a two-and-a-half year wait for the historic Return to Flight mission. STS-114 included breathtaking in-orbit maneuvers, tests of new equipment and procedures, and a first-of-its-kind spacewalking repair.

The flight provided unprecedented information on the condition of an orbiter in space. Astronaut Soichi Noguchi, representing Japan Aerospace Exploration Agency, and Steve Robinson, STS-114 mission specialist, did three successful spacewalks at the International Space Station and *Discovery* transported tons of equipment and supplies to and from the station.

Discovery touched down Aug. 9 at Edwards Air Force Base in California, capping a 5.8-million-mile journey and successful reentry. The orbiter returned Aug. 21 to Kennedy Space Center atop a modified Boeing 747 called the Shuttle Carrier Aircraft.

NASA STS114-S-022

***Discovery** and its seven-member crew launch at 10:39 a.m. EDT and begin the two-day journey to the International Space Station.*

NASA ISS011E11074

This is an image taken by NASA Science Officer and Flight Engineer John Phillips of Discovery as it approaches the station and performs a backflip to allow photography of its heat shield. Discovery was about 600 feet from the station. Station Commander Sergei Krikalev and Phillips took photos for about a minute and a half as Discovery Commander Eileen Collins guided the spacecraft through the flip. The photos will be analyzed by engineers on the ground as additional data to evaluate the condition of Discovery's heat shield.

NASA STS114-S-045

The STS-114 crewmembers gather for a crew photo in front of Space Shuttle Discovery following landing at Edwards Air Force Base in California. From the left are astronauts Steve Robinson, mission specialist; Eileen Collins, commander; Andy Thomas, Wendy Lawrence, Soichi Noguchi representing Japan Aerospace Exploration Agency, Charlie Camarda, all mission specialists; and Jim Kelly, pilot.

NASA S114E6221

One of the STS-114 crewmembers holds a piece of the gap filler material (inset), which had been protruding from between Thermal Protection System tiles and which was retrieved during the third spacewalk of the flight by Mission Specialist Steve Robinson. Robinson (left) used his gloved fingers to pull out this gap filler and another one from Discovery's belly while carefully supported and maneuvered by the Canadian-built remote manipulator system, operated inside Discovery's cabin by astronauts Wendy Lawrence and Jim Kelly.

NASA S114E6062

Astronaut Soichi Noguchi, STS-114 mission specialist representing Japan Aerospace Exploration Agency, participates in the mission's first scheduled session of extravehicular activity. Noguchi and crewmate Steve Robinson (out of frame) completed a demonstration of shuttle thermal protection repair techniques and enhancements to the International Space Station's attitude control system during the successful six-hour, 50-minute spacewalk.

NASA/Markowitz/Blair/Sanchez JSC2005E33332

STS-114 Commander Eileen Collins is visibly moved by the crowd's enthusiasm at the homecoming ceremony in Ellington Field's Hangar 276.

Exploration

NASA took the first exciting steps toward realizing the Vision for Space Exploration in 2005, steps that ensure JSC will be in the vanguard.

After taking the helm in April, NASA Administrator Michael Griffin guided a thorough Exploration Systems Architecture study and announced the results of it in September. The new architecture calls for a family of spacecraft that will lift off for the moon in the next decade and serve as the foundation for missions to Mars and beyond. Next, Griffin appointed veteran astronaut Scott Horowitz to lead the Exploration Systems Mission Directorate that will chart NASA's exploration course.

In October, Griffin created the Constellation Systems Program Office at JSC and appointed veteran flight director Jeff Hanley to manage the nuts-and-bolts of designing, building and operating the new fleet. This work includes launch systems, crew, cargo and transfer vehicles, lunar landers and surface systems, habitats, rovers and planetary spacesuits, and a host of infrastructure and supporting systems.

One of the main vehicles in the program will be the Crew Exploration Vehicle, which will carry as many as four humans to lunar orbit and safely home to Earth and as many as six crewmembers to the International Space Station or to a vehicle headed for Mars. Using a shape similar to that of the Apollo spacecraft, this new crewed capsule will take advantage of the latest in communications, navigation and life support technology. It will be launched into orbit using rockets based on existing shuttle boosters and engines, then be carried on to the moon by engines originally designed for the Apollo Program. But first, it will prove itself by carrying crew and cargo to the International Space Station.

Work on the new capsule and parachute reentry systems is ramping up at JSC, with the first parachute tests scheduled for early next year. Astronauts, engineers and life scientists are beginning to design the interior layout of the capsule cockpit using a full-sized mockup assembled in the Building 9 Space Vehicle Mockup Facility.

By this summer, a prime contractor for the crew vehicle will be chosen to complete the designs that will lead to a first flight in slightly more than five years.

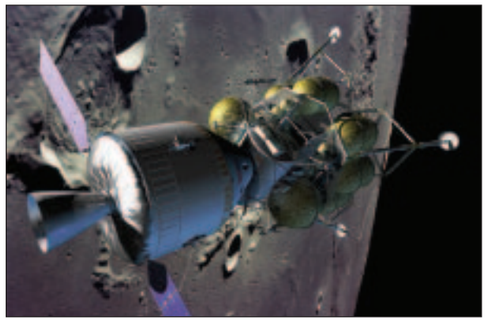
The launch system that will take the crew to space builds on powerful, reliable shuttle propulsion elements. Astronauts will launch on a rocket made up of a shuttle-derived solid rocket booster, with a second stage powered by a shuttle main engine.

A second, heavy-lift system uses a pair of longer solid rocket boosters and five shuttle main engines and a newly designed stage to put up to 125 metric tons in orbit—about one-and-a-half times the weight of a shuttle orbiter. This versatile system will be used to put the components needed to go to the moon and Mars into orbit.

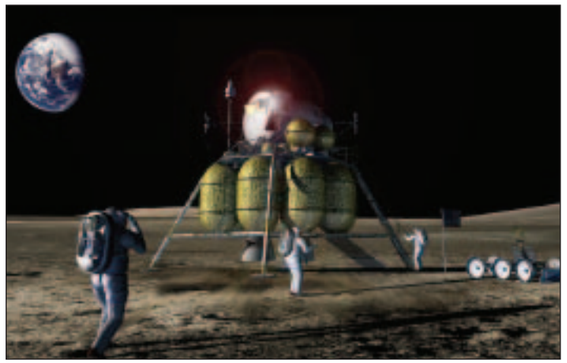
The crew launches separately, then docks their capsule with the lander and departure stage and heads for the moon.

All images by John Frassanito and Associates

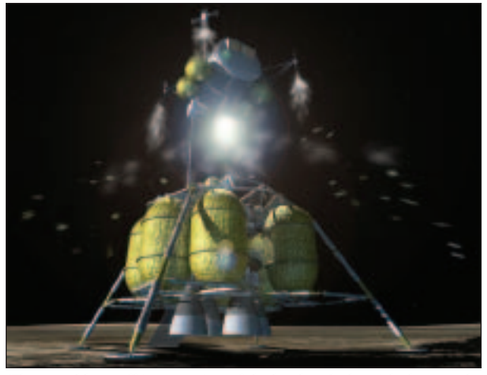
The new ship will also ferry crew and supplies to the International Space Station.



After a three-day trip to the moon, the crew goes into lunar orbit.



After landing on the lunar surface, a crew consisting of up to four members leaves the crew module unmanned in orbit and explores the surface.



The crew blasts off in a portion of the lander, docks with the capsule and travels back to Earth.

After a de-orbit burn, the service module is jettisoned, exposing the heat shield for the first time in the mission. The parachutes deploy, the heat shield is dropped and the capsule sets down.